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<JCTVC-J0202/J0212/J0313> ScanType Swapping for Transform Skip Mode

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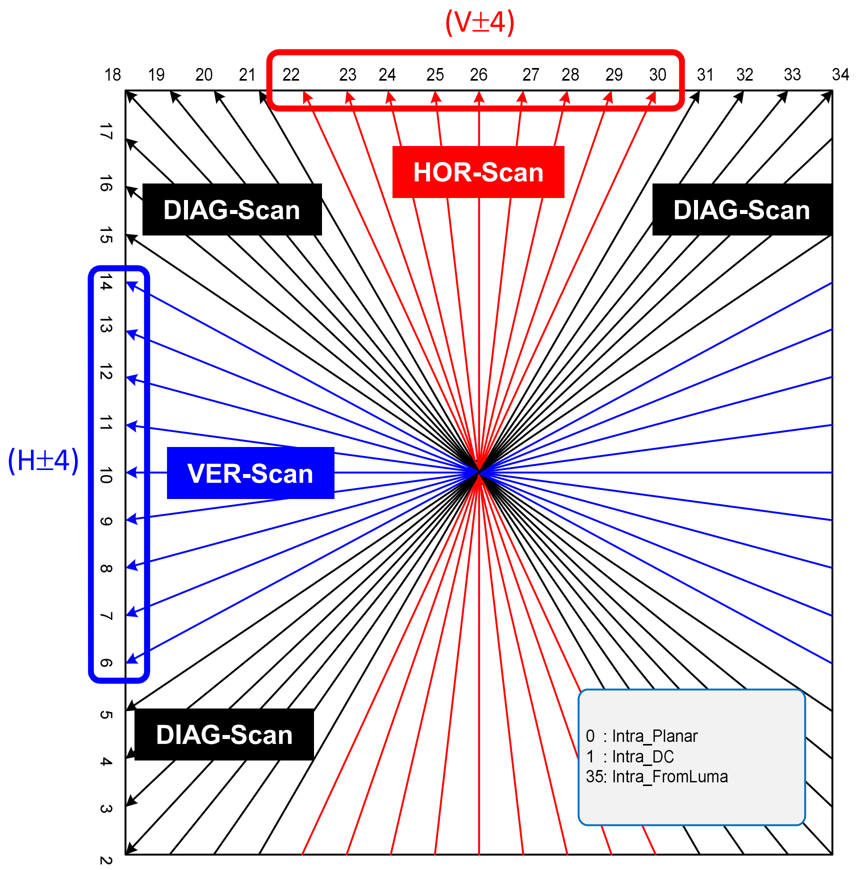
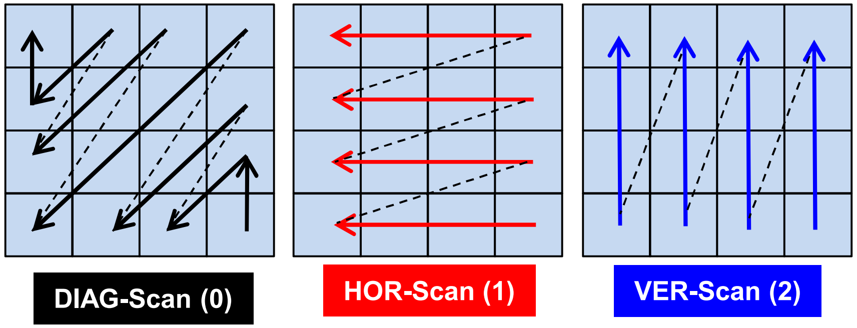
Introduction

❑ HM 7.0 Mode-Dependent Coefficient Scanning

- ❖ Scanning direction is roughly perpendicular to prediction direction
- ❖ *Make sense for transformed residue, but not for spatial residue*

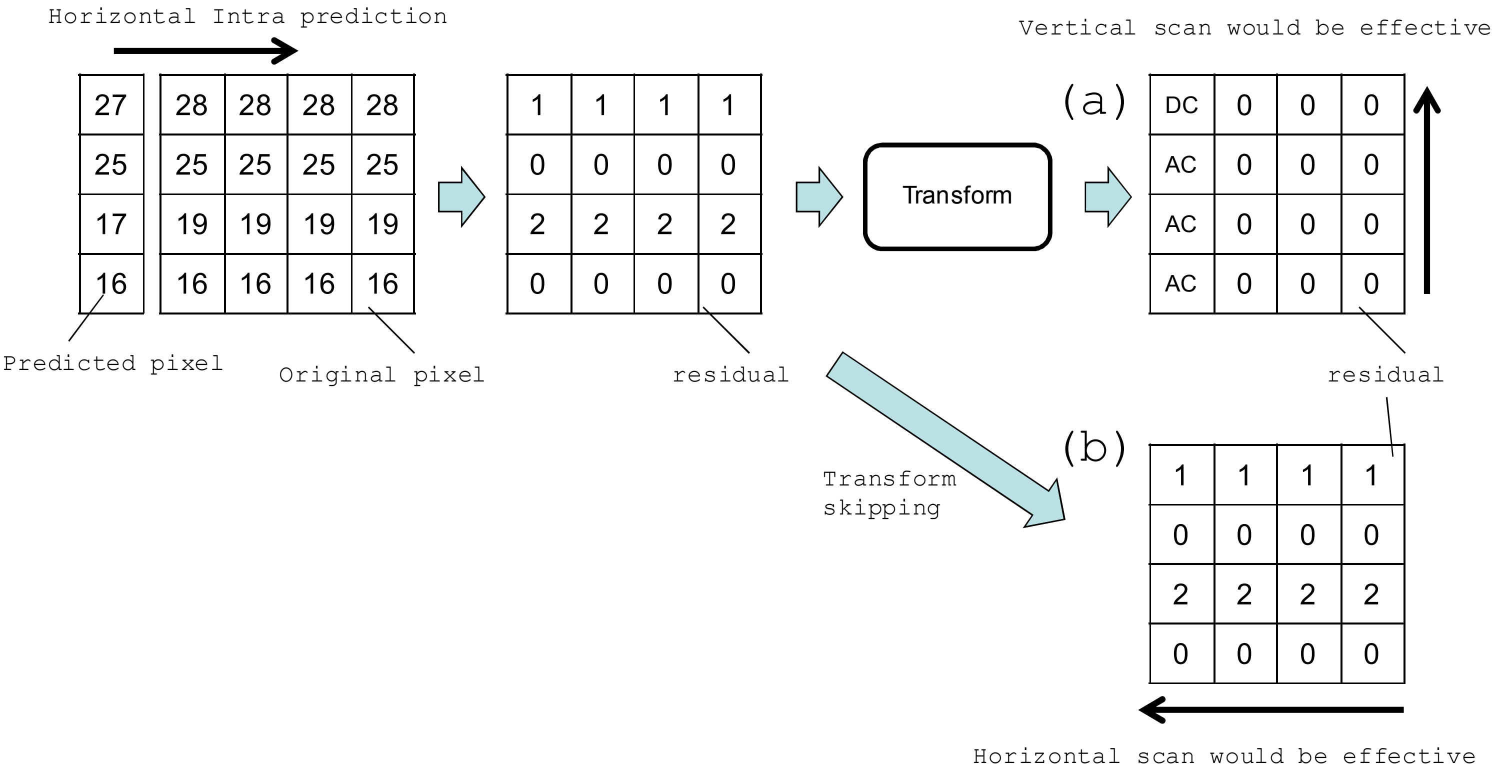




A Case Study

❑ Horizontal intra prediction case

- ❖ Vertical scan is preferable for transformed residue since zero coefficients tend to be successive in a vertical direction after transforming
- ❖ However, if the transform were skipped, the vertical scan would not be effective since zero coefficients tend to be successive in horizontal direction


Horizontal Intra prediction
Predicted pixel
Original pixel
residual
Transform
Vertical scan would be effective
(a)
residual
Transform skipping
(b)
Horizontal scan would be effective

Predicted pixel / Original pixel

27	28	28	28	28
25	25	25	25	25
17	19	19	19	19
16	16	16	16	16

residual

1	1	1	1
0	0	0	0
2	2	2	2
0	0	0	0

(a)

DC	0	0	0
AC	0	0	0
AC	0	0	0
AC	0	0	0

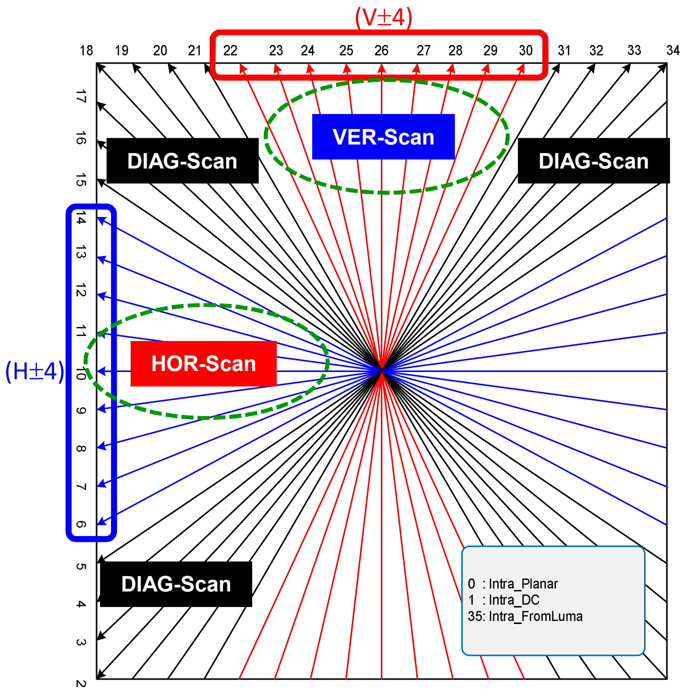
(b)

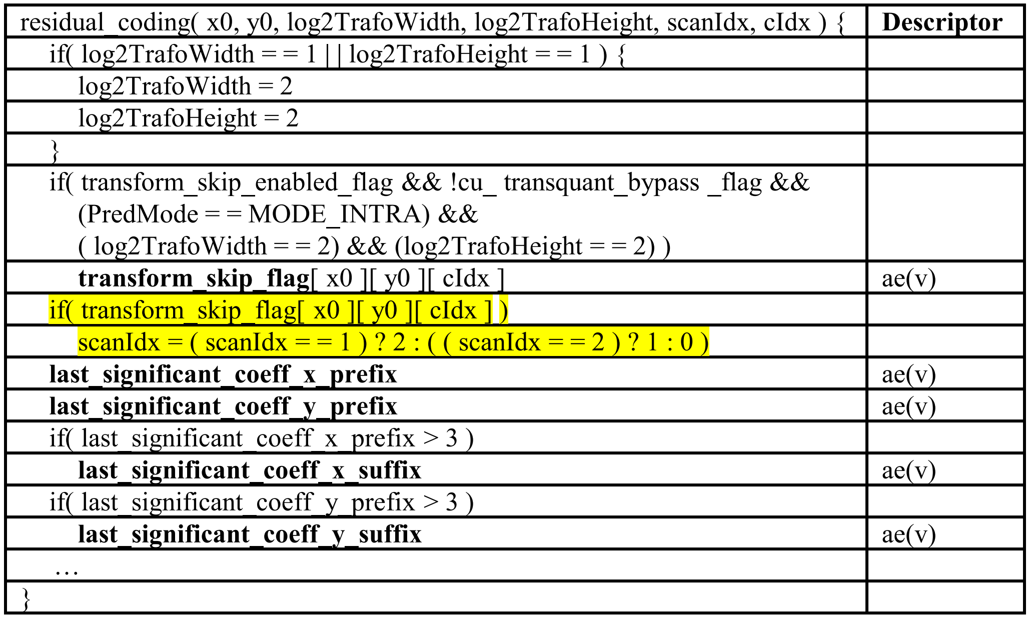
1	1	1	1
0	0	0	0
2	2	2	2
0	0	0	0

Proposal

❑ ScanType swapping for transform skipped block

- ❖ Use vertical scan for vertical prediction modes and horizontal scan for horizontal prediction modes
- ❖ Requires just two lines of syntax change. No change in decoding process needed.





residual_coding(x0, y0, log2TrafoWidth, log2TrafoHeight, scanIdx, cIdx) {	**Descriptor**
if(log2TrafoWidth = = 1 | | log2TrafoHeight = = 1) {	
log2TrafoWidth = 2	
log2TrafoHeight = 2	
}	
if(transform_skip_enabled_flag && !cu_ transquant_bypass _flag && (PredMode = = MODE_INTRA) && (log2TrafoWidth = = 2) && (log2TrafoHeight = = 2))	
transform_skip_flag[x0][y0][cIdx]	ae(v)
if(transform_skip_flag[x0][y0][cIdx])	
scanIdx = (scanIdx = = 1) ? 2 : ((scanIdx = = 2) ? 1 : 0)	
last_significant_coeff_x_prefix	ae(v)
last_significant_coeff_y_prefix	ae(v)
if(last_significant_coeff_x_prefix > 3)	
last_significant_coeff_x_suffix	ae(v)
if(last_significant_coeff_y_prefix > 3)	
last_significant_coeff_y_suffix	ae(v)
…	
}	

Results

❑ Experimental Results

- Anchor: TS-enabled HM7.0
- JCTVC-J0202 is verified by Sharp (JCTVC-J0386)
- JCTVC-J0212 is verified by TI (JCTVC-J0212)
- JCTVC-J0313 is verified by I2R (JCTVC-J0407)

	All Intra Main			All Intra HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Class B	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%
Class C	-0.1%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%
Class D	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.2%
Class E	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Overall	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%
Class F	-0.9%	-0.9%	-1.0%	-0.9%	-0.8%	-0.8%
Enc Time[%]		101%			100%	
Dec Time[%]		100%			99%	

	Random Access Main			Random Access HE10		
	Y	U	V	Y	U	V
Class A	0.0%	0.1%	-0.2%	0.0%	0.0%	-0.4%
Class B	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%
Class C	0.0%	-0.1%	-0.2%	0.0%	0.0%	-0.1%
Class D	-0.1%	-0.2%	-0.1%	0.0%	-0.2%	-0.6%
Class E						
Overall	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.3%
	0.0%	-0.1%	-0.1%	0.0%	-0.1%	-0.3%
Class F	-0.7%	-0.6%	-0.9%	-0.7%	-0.5%	-0.6%
Enc Time[%]		100%			99%	
Dec Time[%]		100%			99%	

	Low delay B Main			Low delay B HE10		
	Y	U	V	Y	U	V
Class A						
Class B	0.0%	0.1%	-0.1%	0.0%	0.1%	-0.1%
Class C	0.0%	0.1%	-0.1%	0.0%	0.0%	0.0%
Class D	0.0%	0.4%	0.4%	0.0%	0.5%	0.0%
Class E	0.1%	-0.7%	-0.8%	0.1%	-0.9%	0.0%
Overall	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%
	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%
Class F	-0.5%	-0.3%	-0.9%	-0.3%	0.3%	0.3%
Enc Time[%]		100%			99%	
Dec Time[%]		100%			99%	

Conclusion

❑ ScanType swapping for transform skipped blocks

- ❖ 0.9% gain in class F with a simple index swapping with transform skip
- ❖ No change in decoding process involved
- ❖ Proponents suggest adopting the proposed method into the DIS

Changes to residual_coding():

…	
if(transform_skip_enabled_flag && !cu_ transquant_bypass _flag && (PredMode = = MODE_INTRA) && (log2TrafoWidth = = 2) && (log2TrafoHeight = = 2))	
transform_skip_flag[x0][y0][cIdx]	ae(v)
if(transform_skip_flag[x0][y0][cIdx])	
scanIdx = (scanIdx = = 1) ? 2 : ((scanIdx = = 2) ? 1 : 0)	
last_significant_coeff_x_prefix	ae(v)
last_significant_coeff_y_prefix	ae(v)
…	

Thank You Very Much !